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To predict a customer subscribes to a term deposit, we trained a GradientBoostingClassifier on the Bank dataset.

We used Permutation Importance (PI) to rank global features, SHAP to provide both global and local explanations, and LIME to provide local case-specific explanations.

Lastly, we compared the three methods to seek similarities and differences on their explanations.

Consistencies & Differences

1. Permutation Importance (PI) describes the most predictive global features but fails to tell whether their effect is positive or negative.
2. SHAP summary plot confirms the ranking of PI and, in addition, indicates whether the effect is positive or negative (e.g., longer call duration makes it more likely to subscribe).
3. SHAP local force plot adds personalized logic to indicate how specific characteristics attracted a customer to, or turned them off to, subscribing.
4. LIME explanations offer human-readable, intuitive rules as to why certain predictions were made to individual customers.
5. PI and SHAP agree on the important features, such as length of time, age, and prior results.
6. There are some slight differences in SHAP and LIME at the local level, in the methods of their approximation.
7. PI is constant and international whereas LIME may change among runs because it uses sampling.
8. SHAP is more mathematically sound but a costly process; LIME is neither computationally cheap nor difficult to interpret in practice.

9. Collectively these approaches are complementary: PI provides global ranking, SHAP provides global + local balance, LIME a simple local reasoning.
10. This multi means approach guarantees reliable and clear explanations of both the world trends and personal forecasts.